Experiments for obtaining field influence mass particles.

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Abstract

Analyzing time dilation experiments the existence of a universal field interacting with moving mass particles is obtained. It is found that mass particle changes its properties depend on its velocity relative to this universal scalar field and not on its velocity relative to the laboratory. High energy proton momentum, energy and mass were calculated obtaining new results. Experiments in high energy accelerators are suggested as additional proofs for the existence of this universal field. This universal field may explain some results of other high energy experiments.

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Analyzing time dilation experiments: of particle lifetime and time rate of flying atomic clocks I obtain a universal field which, changes in particles properties such as energy, mass, momentum and time rate are depending on the particle velocity inside this universal field. This field can be a scalar field with my additional finding that the particle velocity is measured compared to this field and not compared to its rest mass in the laboratory or the particles accelerator frame. This field denoted here as universal field exists on the entire universe according to the postulation which, physics phenomena are the same in the entire universe. There are many papers on preferred inertial frame in the theory of relativity [1-5] in this paper I present a proof based on experiments results for the existence of a universal field which, could be denotes as a preferred inertial frame. I suggest high energy collider experiments for finding this universal field. The first analyzed experiment is of two particles for example, mouns, the first is at space and the second is on earth surface. The first moun move towards earth at a constant velocity -v. x', t' are the particle coordinates in his reference frame. The earth frame is considered as the inertial frame with coordinates x,t. Both muons appears in the experiment at time t'= t=0 since the mouon on earth surface is at coordinate x'=0 at time t'_1=0. It is assumed that the two muons lived before the experiment started negligible time compared to there lifetime in both frames, enough just to bring the space moun to constant velocity –v.

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The Lorentz transformation for time
(1a)

$$t = \frac{t' - vx'/c^2}{\sqrt{1 - \frac{V^2}{C^2}}}$$

(1b)

at time $t'_1 = 0$ the muon from space is at location x' in it's reference frame.

$$t_1 = \frac{0 - vx'/c^2}{\sqrt{1 - \frac{V^2}{C^2}}}$$

The negative value of t_1 meaning there is delay time till the muon from space will be indentified at earth surface coordinate x=0. At time t_2 the muon from space is at location x' in it's reference frame as well.

(1c)

$$t_2 = \frac{t'_2 - vx'/c^2}{\sqrt{1 - \frac{V^2}{C^2}}}$$

The moving muon from space lifetime in it's reference frame is $\tau' = t_2' - t'_1$ .This life time is measured at the inertial frame as $\tau = t_2 - t_1$. Subtracting eq. 1c from eq.1b gives,
(1d)

$$\tau = \frac{\tau'}{\sqrt{1 - \frac{V^2}{C^2}}}$$

τ' is also the lifetime of the second muon at rest in the inertial frame of earth surface at coordinate x=o. In the inertial frame the muon from space when getting close to earth surface would still exist where the surface muon would had already decayed. According to special relativity the opposite case is also valid, for example the moun from space x',t' is considered to be in inertial frame and the moun on earth surface x,t is considered to travel towards the high altitude moun at velocity v of the opposite direction to to the previous case . The Lorentz transformation describing this are,
(2a)

$$t' = \frac{t + v \cdot x/c^2}{\sqrt{1 - \frac{V^2}{C^2}}}$$

at time $t'_1=t=0$ the muon from earth is at location $x'=x=0$.

(2b)

$$t_1' = \frac{t_1 + vx/c^2}{\sqrt{1-\frac{V^2}{C^2}}} = \frac{0 + v \cdot 0/c^2}{\sqrt{1-\frac{V^2}{C^2}}} = 0$$

at time t'_2 the muon from earth is at location x=0 in it's reference frame.
(2c)

$$t_2' = \frac{t_2}{\sqrt{1-\frac{V^2}{C^2}}}$$

In this case he earth surface muon lifetime in it's reference is $\tau = t_2 - t_1$ this life time is measured at the inertial frame of the space muon as $\tau' = t_2' - t'_1$. Subtracting eq. 2c from eq.2b gives,

(2d)

$$\tau' = \frac{\tau}{\sqrt{1-\frac{V^2}{C^2}}}$$

τ is also life time of the space muon at rest in this inertial frame. The lifetime of the earth Moun is considered to be longer in this inertial frame and when the two muons will be close the high altitude muon would already decayed and the earth moun would still exist. The two cases have contradicted results, on the first case the life time on the moun at earth is longer on the second case the life time of the muon arriving from space is longer both describe the same physical event which imply a contradiction in the theory. This experiment is different from the twins paradox since there is only one movement direction in this experiment as opposed to two directions in the twins paradox. Although the twins paradox is explained by the universal field too.

The second experiment is of flying atomic clock around the world [6]. In this experiment four cesium beam atomic clocks were flown around the world twice, once eastward and once westward . The time difference between the flying clock and the clock stayed on the earth's surface was compared. In regular calculations of special relativity the time difference is calculated as considering the clock on the surface at an inertial frame. The airplane is considered to move in velocity v in the eastward trip and in velocity v but in the opposite direction in the westward trip. The rotational frame can be considered as inertial in infinitesimal increments. The time dilation in special relativity calculations depend on the square of v thus according to theory of relativity in both directions the time at the clocks on the plane would change slower

and these clocks would lose time in both flight directions compared to the clock on earth surface, even if including the time rate increase by gravitation in the higher altitude of the plane flight. This is not in agreement with the experiment results the flying clock loss 59 ± 10 ns during the eastward direction and gain 273± 7 ns during the westward trip. The experiment results can only be explained by taking into account the universal field as universal inertial frame. The earth has a rotational velocity, in the eastward direction flight the velocity of the plane is positively added to the earth velocity and increased the velocity of the airplane's clock in the universal field/universal inertial frame. In this universal field the clock on the plane velocity is larger than the velocity of the clock which stayed on the earth surface, thus the time on the flying clock changed slower. In the westward flight the airplane velocity added negatively to the earth velocity decreasing the velocity of the airplane's clocks in the universal field compared to the velocity of the clock on the surface. Thus the airplane's clocks time changed faster than the time on the surface clock result in gaining time compared to the clock on the surface. In order to explain there experiment results Hafele and keating [6] took a third frame, the North pole, as inertial frame this calculation gave closer results to the experiment because this frame direction is closer to the universal frame direction but the paper state it has 47.5% difference between the theoretical and experimental results with ±57.5% error deviation in one direction and 0.7% difference between the theoretical and experimental results with ± 7.6 % error deviation in the second direction this indicates this frame is only an approximation to the real inertial frame of the universal field. From the results of the two experiments the existence of a universal field is concluded, regarded as a universal inertial frame. Mass particle time rate is determined by the particle velocity relative to this universal field. Following the derivations of special relativity equations and Lorentz transformations it is a straightforward to conclude that this universal field is also responsible to the other properties of mass particles that depends on velocity such as particle momentum, mass and energy. This field is considered as a scalar field. At least in approximations of local area in an astronomical scale and negligible gravitational potential differences inside this area compared to the particles energy. The relation between this field and gravitational field should be determined in future research. This finding is based on the experimental result that the speed of light is constant in vacuum as in Einstein's special relativity.

Calculation of velocity relative to this universal scalar fled is done by special relativity velocities addition. For the general case [7] the relativistic addition is given by,

$$(3)\quad \bar{u} \oplus \bar{V} = \frac{1}{1+(u\cdot V)/C^2}\{u + \frac{1}{\gamma_u}V + \frac{1}{c^2}\frac{\gamma_u}{1+\gamma_u}(u\cdot V)u\}$$

C is the vacuum velocity of light. $\bar{u}, \bar{V} \in R^3$ are the two vectors velocities added. $R_c^3 = \{V \in R^3 : \|V\| < C\}$. R_c^3 is an open ball of radius C centered at the origin of the Euclidean three- space R^3, consisting of all velocities V in R^3 with magnitude. |v| smaller than C. $\gamma_u = \frac{1}{\sqrt{1-\frac{\|u\|^2}{c^2}}}$.

In the universal scalar field the velocities sum of eq.3 is denoted by V_a the mass particle velocity in the universal field.

The Lorentz factors are written with V_a ,

(4) $\beta = \frac{V_a^{\,2}}{C^2}$, (5) $\gamma = \frac{1}{\sqrt{1-\frac{V_a^{\,2}}{C^2}}}$

The difference of these equations from the special relativity Lorentz factors is, V_a is an absolute velocity magnitude in the universal field and not a relative velocity in any arbitrary frame as in special relativity. The two terms 4,5 should be substitute in any equation where the special relativity Lorentz factors β and γ respectively appears. This give more accurate values of particles properties. For example the equations for particle properties in the inertial frame of the universal field are:

The equation for mass , m_0 is the rest mass.

(6) $m = \frac{m_0}{\sqrt{1-\frac{V_a^{\,2}}{C^2}}}$

The equation for momentum ,

(7) $p = \frac{m_0 V_a}{\sqrt{1-\frac{V_a^{\,2}}{C^2}}}$

The equation for the total energy,

(8) $E = \frac{m_0 C^2}{\sqrt{1-\frac{V_a^{\,2}}{C^2}}}$

The equation for the particle lifetime ,

(9) $t = \frac{t_0}{\sqrt{1-\frac{V_a^{\,2}}{C^2}}}$

Where t is the particle life time in the universal field and t_0 is the particle proper time.

For the special case where the accelerator velocity in the universal field is V and the proton velocity in the accelerator u are in the same direction. The proton properties in high energy accelerator is calculated by the velocities addition equation,

(10) $V_a = \frac{V+u}{1+vu/c^2}$

where V_a is the proton velocity in the universal field, V is the proton velocity in the accelerator and u is the accelerator velocity in the universal field. In figure.1 we calculated by equations 7,10 the proton momentum in the universal field with

different accelerator velocities inside the universal field. The proton velocity in the accelerator is 0.999999991C as the velocity in LHC, proton rest mass is 1.6762E-27 kg. In figure.1 the zero velocity presents the accelerators at rest in the universal field or presents the proton momentum without taking into account the velocity relative to the universal field. We obtain that the proton momentum could be larger or smaller compared to the proton momentum value without considering the influence of the universal field, depends on the proton velocity inside the accelerator and the accelerator velocity in the universal field.

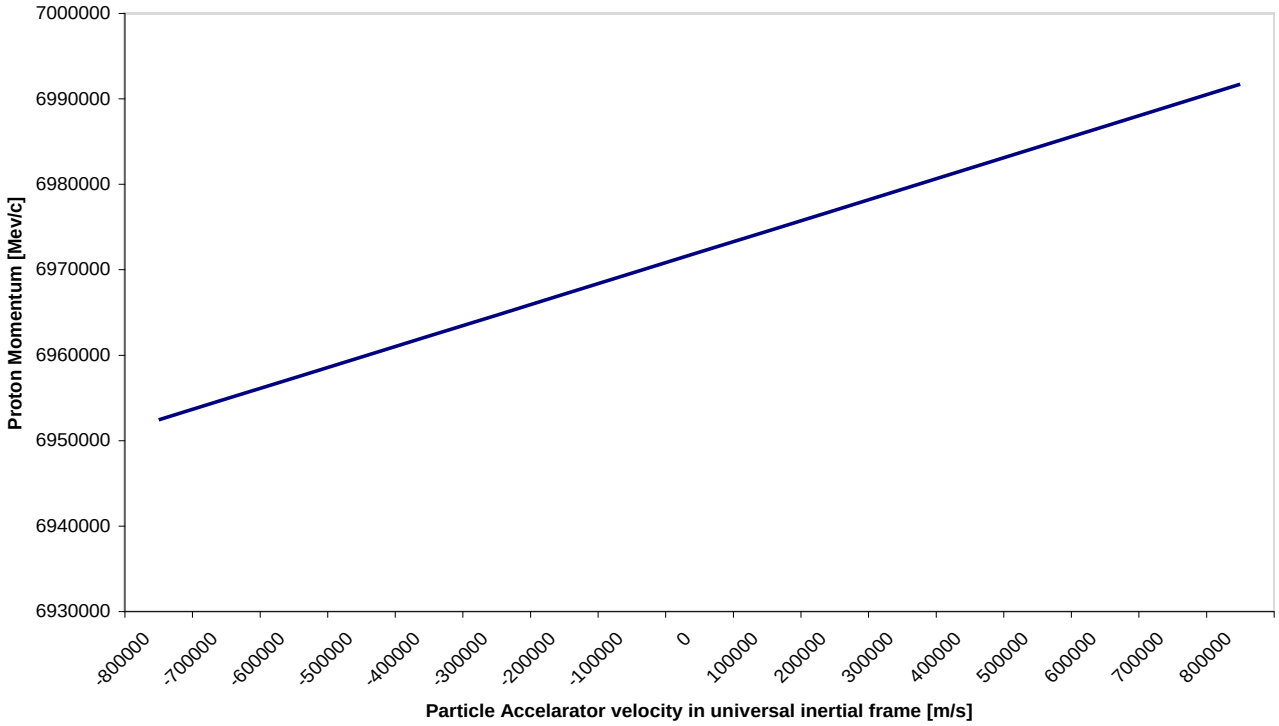

Fig 1.Proton momentum compared to different accelerator velocities in the universal field. The proton velocity inside the accelerator is 0.999999991C

I calculated the proton energy traveling at the speed of 0.999999991C inside the accelerator for a range of accelerator velocities in the universal field. Figure 2 show the proton energy may vary by 39,322 Mev in the considered accelerator velocity range. Although this energy difference is high and enough to create particles, it is less than 0.6% of the proton energy thus it was considered as a measurement error in previous experiments. The zero accelerator velocity gives the proton energy for a calculation without accelerator velocity in the universal field or the particle energy where the accelerator is not moving at the universal field.

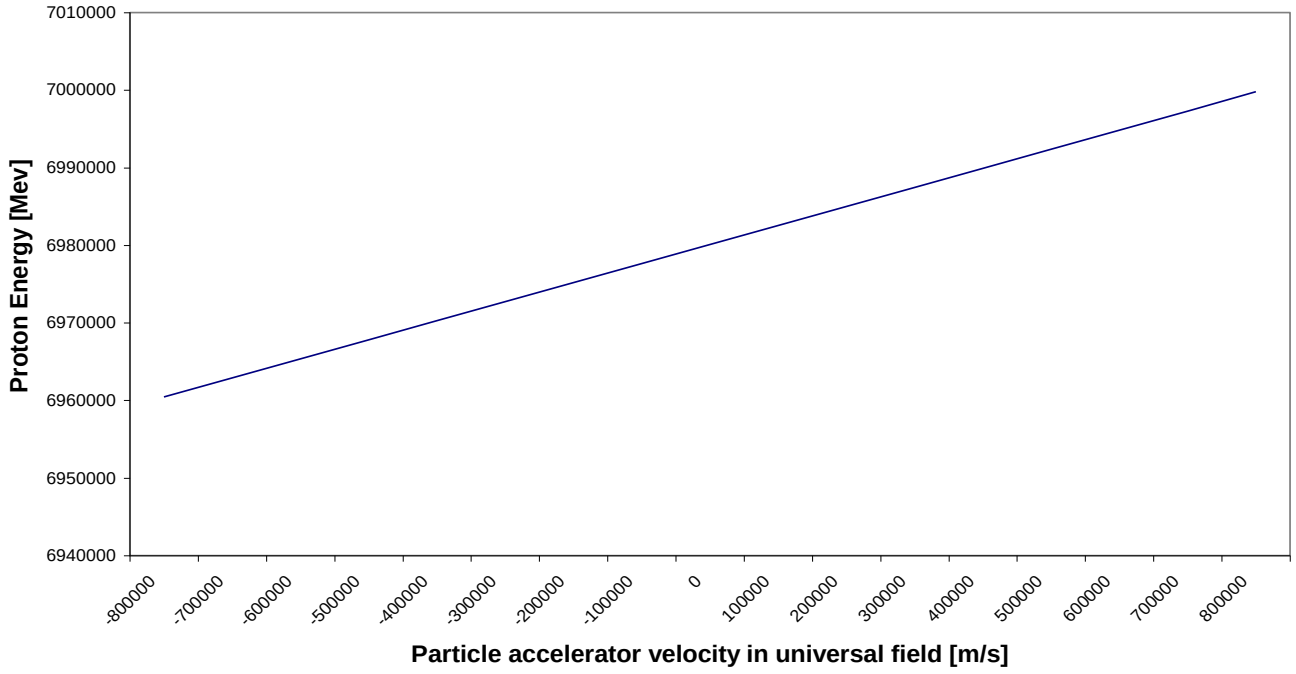

Figure.2 Proton energy in the universal field versus different accelerator velocities inside the universal field. The proton velocity inside the accelerator is 0.999999991C.

The difference between the proton energy with or without including the universal field in the calculations can be detected in laboratory measurements at smaller energies too. For proton moving inside the accelerator at a velocity of 0.9C the difference between the predicted proton energy in the two cases is 0.2%.

Other suggested experiment is for finding the accelerator velocity and direction in the universal field. The proton energy is measured in different places at the accelerator obtaining different angles between the proton movement and the accelerator movement direction in the universal field. For a special case where the proton movement and accelerator movement in the universal field are in the same plane the proton velocity in the universal field is,

$$(11)\quad V_a = \frac{\sqrt{u^2\cos^2(\alpha) + 2u\cos(\alpha)V + V^2 + u^2\sin^2(\alpha)(1-\frac{V^2}{C^2})}}{1+u\cos(\alpha)V/C^2}$$

u is the proton velocity relative to accelerator direction in the universal field , V is the accelerator velocity in the universal field and α is the angel between u and V. We found proton energies are different at different angles. From experimental measurements of proton energies at different locations in the accelerators the magnitude and direction of the accelerator velocity in the universal field can be obtained.

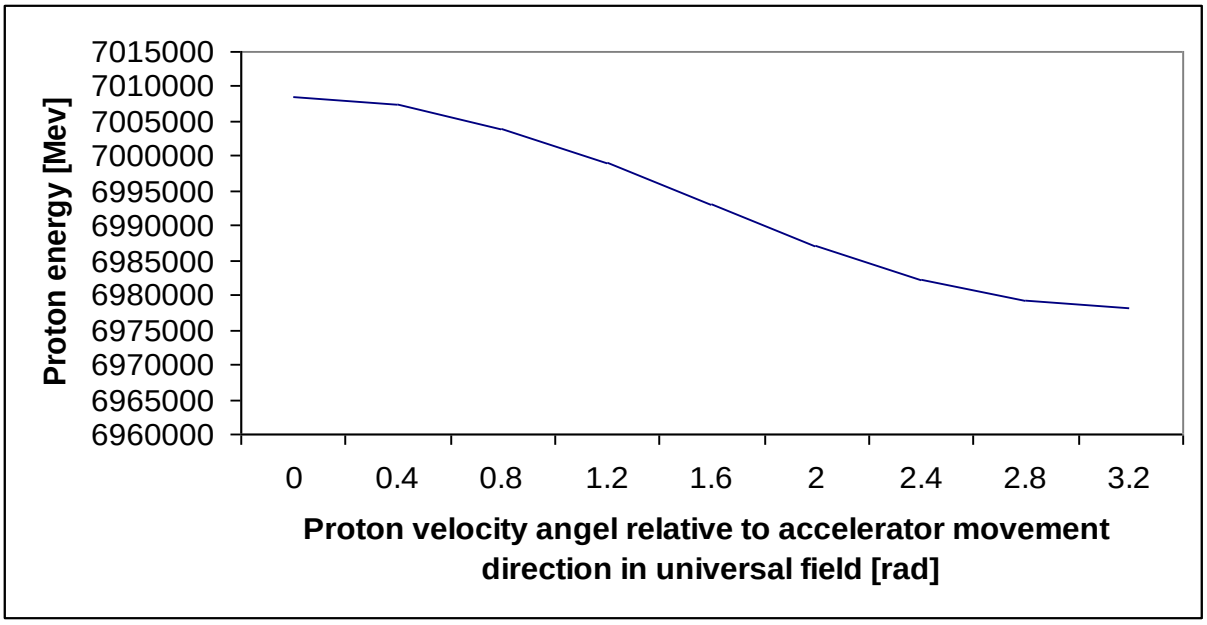

Fig 3. The proton energy for different angles between proton velocity relative to accelerator frame and accelerator movement direction in the universal field. The proton velocity in the accelerator is 0.999999991C and the accelerator velocity is 650,000 m/s.

We calculated the total energy of two protons in a head on collision each of the protons move with velocity 0f 0.999999991C in the accelerator inertial frame. The total energy without considering the universal field is 13,986,752 Mev. The total energy when considering a velocity of 650,000 m/s as the accelerator velocity in the universal field parallel to the head on collision is calculated by

$$(12)\quad E_{tot} = \frac{m_0 C^2}{\sqrt{1-\frac{V_{a1}{}^2}{C^2}}} + \frac{m_0 C^2}{\sqrt{1-\frac{V_{a2}{}^2}{C^2}}}$$

Where Va_1 is the velocity of the proton moving in the same direction as the accelerator movement inside the universal field and Va_2 is the second proton velocity moving in opposite directions inside the universal field, Va_2 is obtained by relativistic velocity additions where the proton velocity in the accelerator and the accelerator velocity in the universal field have opposite signs , the total energy now is 13,986,785 Mev. Small difference between the calculations with or without

considering the accelerator velocity in the universal field obtained in other velocities as well, although the center of mass velocity is 312,137m/s when the accelerator velocity in the universal field was added to the calculation instead of zero velocity of the center of mass in a head on collision without considering the universal field.
In a system of a stationary particle and a moving particle the differences in the total energy is larger. We calculated two protons collision where one proton is moving at a speed of 0.999999991C and the other is static in the accelerator frame. The accelerator velocity in the universal field is assumed as 650,000 m/s. Figure 4 describes the ratio between these particles total energy in the universal field frame divided by the total energy in the accelerator frame without considering the universal field.

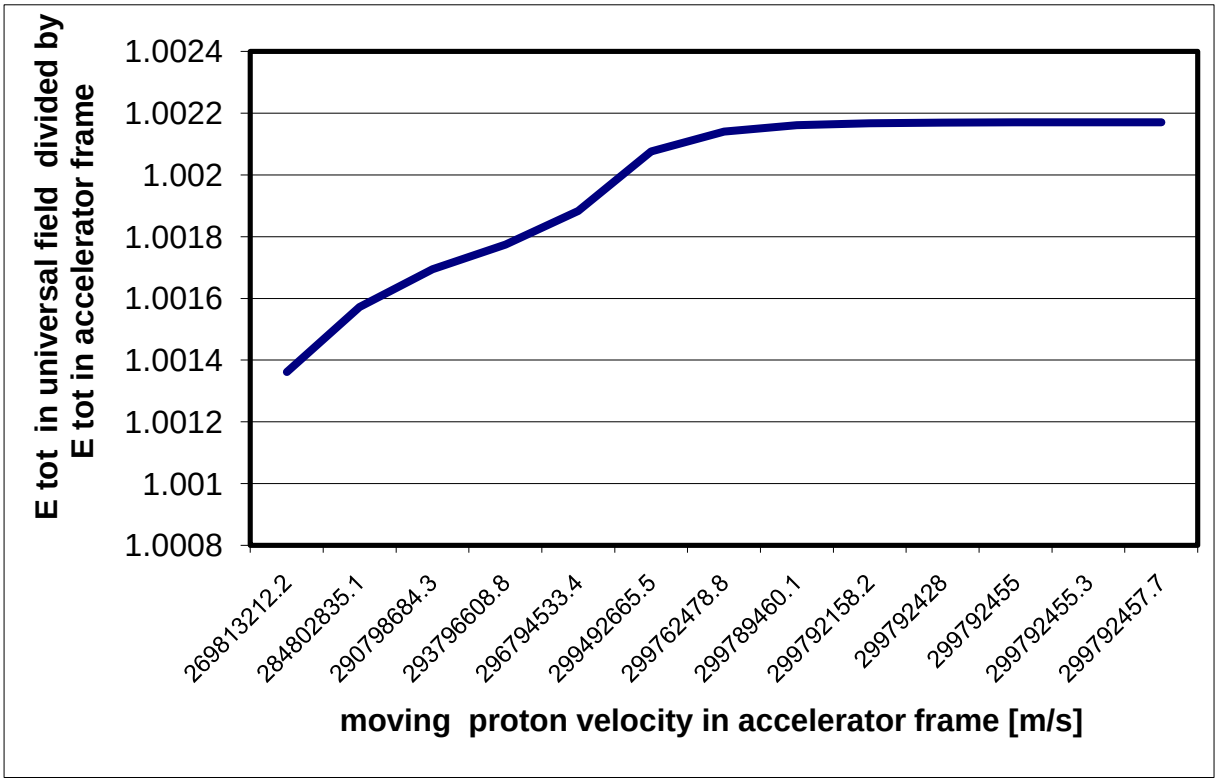

Fig.4. Two protons system. Ratio between E total in universal field inertial frame to E total in accelerator inertial frame.

Another suggested experiment to measure the influence of this field is measuring particles life time. There is a measurable difference between the particle life time if it's velocity considered relative to the universal field or relative to arbitrary field. For example I suggest to measure the life time of B^+ for different velocities of the laboratory (particles accelerator) in the universal field. This could be achieved by measuring the particles life time at different directions in the accelerator as discussed in figure 3 or at different hours and days where earth and accelerator movement directions are different relative to the universal field. B^+ rest mass is 5279.2 Mev, B^+ life time at rest is $1.64 \cdot 10^{-12}$ sec. Figure 5 presents B^+ life time for different

accelerator velocities relative to the universal field and particle energy of 1 Tev relative to accelerator frame.

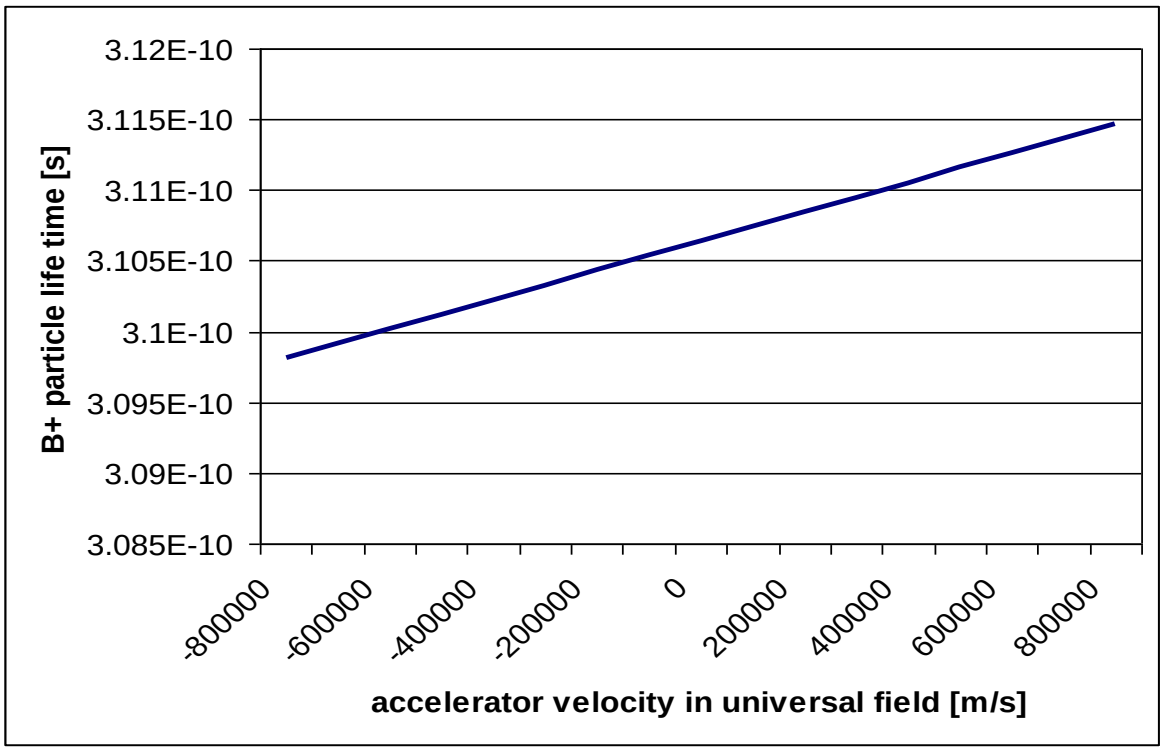

Fig.5. Particle B^+ life time at different accelerator velocities. B^+ energy is 1Tev relative to accelerator frame.

In the graph of fig.5 there is a difference of 0.53% between B^+ life time at the maximal accelerator velocities in the opposite directions relative to the universal field. The B^+ life time without considering the accelerator velocity in the universal field can be described by velocity zero in the graph, the difference between the particle life time at the maximal accelerator velocity in the universal field b compared to this life time is about ±0.26% depend on the accelerator velocity direction.

The effect of this universal field was not noticed before because almost all the experiments measure the particles parameters only in one frame. In the flying atomic clocks experiments where the measurements in both frames were compared the effect of the universal field was clearly noticeable. In almost all the experiments the measurement are done in the laboratory frame if this frame velocity is about 650,000 m/s in the universal field frame, as earth approximated velocity in the milky way galaxy, the difference between the particles parameters calculated by the laboratory as the inertial frame compared to the universal field as the inertial frame is less than 0.5% , for particles energy lower than 1Tev or lower velocity of laboratory in the universal field frame the difference could be even less. Thus the difference by not considering the universal field in the calculation was considered as the experiment error range or anomaly.

If acceleration period was the cause for the change in particles momentum, mass and energy. By symmetry consideration an acceleration in opposite direction of the particle velocity should increase the magnitude of the mass and energy but experiments showed that particle acceleration in the opposite direction, deceleration, decrease the particle mass and energy. In addition according to this argument in a rotational movement of a constant acceleration should be a constant increase in particle mass and energy but this is not the case the particle mass and energy remain constant. This conclude that the velocity is the cause for the change in particle properties. Increase in particle velocity in the universal field increase the particle energy, mass, momentum and decrease its time rate. Decrease in the particle velocity in the universal field decrease these particle properties.

In conclusion by analyzing time dilation experiments I found a proof for a universal field which, causes changes in mass particle momentum, energy and time rate depending on the mass particle velocity in this field. I calculated proton mass, momentum, energy and time rate in the universal field inertial frame and compared it to calculations where the accelerator is considered as the inertial frame and found differences up to 0.56% between the two calculations in the given velocities range. In case the accelerator velocity in this field is larger the difference will be larger. High energy experiments were suggested as additional proofs for the existence of the universal field and for measuring the accelerator and earth velocity in this field. In experimental measurements, the velocity of the measurements devices in this universal field and the velocities of the measured particles in the universal frame should take into account when analyzing the results to get more accurate or new results. Also the day and time should take into account in high energy experiment because of earth movement and the change in it's direction and velocity in the universal field. The relativistic lorentz factors were modified to be written only with V_a the velocity in the universal frame, this modification should be added everywhere the Lorentz factors appear for example quantum electrodynamics, standard model, theory of relativity, QCD and scattering equations. In this paper I found particles properties in this universal field but I didn't probe the field structure. Some possible options for this field are the 4 dimensional space- time or a quantized field interacting with leptons and hadrons.

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